Introduction to SLAT

Demonstration Procedure

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1 Run the virtual machine

1. Launch `VirtualBox`
2. Select File : Import Appliance...
3. Chose **`WebSLAT-single.ova`** from your **`C:`** drive.
4. Select the 'WebSLAT-single' virtual machine, then click the little triangle next to Start, and select 'Headless Start'.

2 Connect to the virtual machine

1. Start a web browser
2. Enter 'localhost:3080' into the navigation bar.
3. The page won't load until the vm is done booting. If it times out, just try reloading it.

3 The Welcome Page

- Links to `OpenSLAT` repositories and **Quake Centre** website.
- Links to references
- Click **Enter**

4 Projects

- From here, you can access your projects.
- Seeded with Red Book Project, based on Brendon Bradley's analysis for his original SLAT paper.
- You can create new projects from here, but first let's explore.
- Click Red Book Project.

5 Main Project Page

- As soon as this page is loaded, `SLAT` starts calculating the annual cost.
- Shows the title (name of the project), description, and the return period. All of these can be edited.
- Also allows us to describe the collapse and demolition points, and costs.
- When the cost has been calculated, it is reported, and the Cost vs. IM plot is displayed.
- Also have buttons for:

  Site Hazard view and edit the hazard curve

  Engineering Demands summary of engineering demands

  Component Groups summary of components in the building

  Analysis more details about the seismic losses

  Full Re-calc force a full recalculation of the analysis–just in case you're not sure the results reflect any changes you've made.

6 Site Hazard

- Plot of Rate-of-Exceedance vs. Spectral Acceleration
- This example was interpolated (using a log-log relationship) from supplied data points.
- You can view and edit the points
- . . . or change the way the hazard is defined.
- You'll most likely want to define your hazard curve using NZS 1170.
- Click **Return to Project**, then **Engineering Demands**

7 Engineering Demands

- Can rename and re-order the levels. This shouldn't be necessary, as the names will be taken from the ETABS data, and they will be order by height (according to the data from ETABS).
- Can look at the acceleration and drift functions for each level, in each direction.
  - Click one:
    - We get the demand vs. im plot
    - . . . and a rate-of-exceedance plot for the demand
    - These curves are interpolated from supplied points. Yours will be, too, though `SLAT` will automatically generate the points using the ETABS output and FEMA correction factors.

        * Go back

- Can look at the demand curves
    - Click **Demand Curves**
    - Get a set of plots, showing the the demand for every level, grouped by demand type and direction
    - Go back
- Click 'Components' for Ground Floor
    - This gives us a list of the components for the level, showing:
        * Component identifier
        * An optional comment on the component. Most of these will be 'Created as a pattern group'–more on that in a minute.
        * Number of components sensitive to demand in the X and Y directions, and the number that don't care which direction the demand comes from.
        * A cost adjustment factor, which allows us to tweak cost data to our liking.
        * The estimated annual cost of these components, broken down by direction.
    - There are also controls for each component:
        * **Edit Pattern** lets us change the component type, counts, and adjustment on every floor that uses the pattern. We can also change the floors that use this pattern.
        * **Separate** lets us remove a component from the pattern, for this level only, so that we can edit it without affecting the other floors.
        * **Edit** appears for components that are not part of a pattern. This lets us change the component time, counts, and adjustment.
        * **Delete** removes a component that only appears on this level.
        * **Make Pattern** is sort of the reverse of **Separate**. It turns the component entry into a pattern, that can be used on other floors.
    - The **New Component Group** button lets us add a component to this floor only.
- Click **Return to Project**, then click **Analysis**.

8 Analysis

- This gives us more details about the expected losses
    - Expected loss over time (this assumes a 6% discount rate, which is currently fixed)
- Mean annual cost, by floor
- Mean annual cost, by component type

For a further breakdown, click **Detailed Analysis**

9 Detailed Analysis

- Total cost of each floor
- Contribution to the total annual expense
- List of components on the floor, and their contribution in each direction.
- At the bottom, collapsed by default, is a single table with all the components, which can easily be copied into a spreadsheet or database for further analysis.

10 Now let's create our own project

1. Click **Return to Project List**, then **Create a New Project**.
2. Fill out the form:
   - Give your project title and description
   - Select **ETABS Project**.
   - Specify:
     - Frame type (Moment, Braced, or Wall) in each direction (**Moment**).
     - Select the return period for which the building is designed (**500** years).
     - Enter the Response Modification Coefficient, Importance Factor, and Overstrength Factor from ASCE/SEI 7-10:

Parameter	Value
R	5.0
I	1.0
Ω_0	3.0

     - Choose the spreadsheet file containing your exported ETABS data. We'll be using `ETABS output.xlsx` (this should be on your `C:` drive).
     - Choose the Soil Class and Location for your building site (**C** and **Christchurch**).
   - Click **Create Project**
3. - Top of page confirms some of the data you just entered.
   - `SLAT` uses data from the spreadsheed and the ASCE/SEI 7-10 constants you provided to estimate the yield strength. It reports the range, and offers the midpoint as a default value.
   - Select the period you wish to use for each direction. You can click on the corresponding mass participation ratio for each direction, or manually enter the period. *Tick **0.812** for X (2.365 s) and *0.8198 for Y (2.051 s).*

- By default, `WebSLAT` will use the X direction period when generating the hazard curve, but you can use the Y period, the average of the two, or enter your own value.
- `WebSLAT` reports the height of each story, but you don't need to do anything with them.
- Choose the 'Load Case/Combo' for the 'Equivalent Static' load case for story drift. For this spreadsheet, those are **ES EQX** and **ES EQY**.
- Select the 'Load Case/Combo' corresponding to the 'Modal Response Spectrum Analysis' load case for acceleration. We'll use **MRS EQX mu=4** and **MRS EQY mu=4**.
- Click **Submit**.

4. Project Page We're at the main page for the project. Not that the cost is 'nan'–we don't have any components yet!

   Entering all the components individually is tedious! It is especially annoying to have to do it twice, when you want to compare two design alternatives. Since the example we've just loaded is also based on the Red Book building, let's just copy the components from the project we already have:

   (a) Click **Component Groups**

   (b) Click **Copy Components from Another Project**.

   (c) We don't have any components yet, so it doesn't matter what we do with the **Remove existing components** tick box

   (d) There's only one project to select, so tick **Red Book Project**.

   (e) Click **Submit**

1. Back at the Project Page

   - If the mean annual cost and chart haven't been updated, click **Full Recalc**.

2. That's all–your project has been analysed, and you can explore the results, and experiement with changing components.